

A dispenser for dispensing fluids, such as beverages, including a cylinder (3), a piston (8) reciprocable within the cylinder (3), an inlet (20) to the cylinder (3) and an outlet (41) from the cylinder (3). The arrangement is such that the piston (8) in its reciprocable movement within the cylinder (3) pushes metered amounts of liquid from the cylinder (3) through the outlet (41) on each stroke of the piston (8). The cylinder (3) moves in response to pressure from the fluid being metered. The dispenser includes inlet (24, 30) and outlet (48, 53) valves controlled by a controller which responds to signals from proximity switches (60, 61) sensing the position of the piston (8) in the cylinder (3).

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TITLE: DISPENSER

FIELD OF THE INVENTION

This invention relates to dispensers for metering discrete quantities of fluids and in one aspect relates particularly but not exclusively to dispenser arrangements for metering beverages.

BACKGROUND OF THE INVENTION

In the beverage industry sales staff such as bartenders need to be able to serve a wide range of drinks from different containers. The simplest way of achieving this is to keep a range of bottles of different drinks on the bar and to measure out an amount of the requisite drink in a measuring cup when an order for that particular drink has been placed.

Whilst this approach is suitable for situations where relatively low customer traffic allows drinks to be dispensed in a leisurely manner, it is unsuitable for applications where a high customer demand requires rapid dispensing and measuring of chosen drinks. In the simplest of methods, the operations of picking up a bottle, removing the bottle seal, finding an appropriate measuring cup which is clean and tipping the contents of the measuring cup into a glass are all very time consuming. Furthermore, the bottles are usually of relatively low capacity eg. 750 ml is typical, with the result that bottles are often emptied in a relatively short time and need to be replaced from a central store with consequent time wastage.

To streamline this process, arrangements have been constructed involving a rack for holding a series of different product bottles upside down. The neck of each bottle is provided with a gravity fed manual dispensing device which meters out a requisite amount of fluid into a glass when the dispensing device is pressed. Whilst this approach is superior to that described herein above, it also suffers from the limitation that bottles need to be replaced fairly often. Furthermore, gravity feed is relatively slow and the accuracy of the metered dose is suspect.

In a more advanced design, liquid product from a large product reservoir is fed through a pipe under pressure to a measuring chamber provided with a piston. The stroke of the piston is set so that when it is activated by an operator pressing a switch associated with a dispenser, the piston moves a predetermined distance through the chamber and hence pushes a metered amount of product through a pipe to the dispensing outlet. After the product has been dispensed in this manner, the piston returns to its initial position whilst at the same time replacement product under pressure is fed to the piston chamber. The main disadvantage of this construction is that there is a time delay during which the piston chamber is refilled when the dispenser cannot be used. Again, such a delay is not acceptable in situations where high demands for efficiency are placed on staff serving beverages.

DISCLOSURE OF THE INVENTION

The invention provides a dispenser including:

a cylinder;

a piston reciprocable within the cylinder;

5 inlet means to the cylinder; and

outlet means from the cylinder, the arrangement being such that the piston in its reciprocable movement within the cylinder pushes metered amounts of liquid from the cylinder through the outlet means on each stroke of the piston.

10 In another aspect, the invention provides a method of metering fluid from a source including the steps of:

supplying fluid from the source to a cylinder having a reciprocating piston;

moving the piston a metered distance in the cylinder; and

forcing metered amounts of fluid from the cylinder in response to each stroke of the reciprocating piston.

15 Preferably the fluid is supplied under pressure to the cylinder and the piston moves in response to pressure from the fluid.

The cylinder may include three sections, namely a stroke portion defined by the stroke of the reciprocating piston, a front chamber beyond the most forward reach of the piston stroke and a rear chamber beyond the most rearward reach of the piston stroke.

20 Stop means may be provided at each end of the piston stroke to limit the piston travel within the cylinder and to improve the accuracy of metering of the dispenser.

The stop means may comprise front and rear abutments provided in the cylinder at each end of the piston stroke.

25 The inlet means may be in communication with the cylinder. The inlet means may be arranged to supply fluid into each end of the cylinder. Preferably the inlet means is arranged to supply fluid into each end of the cylinder in front of and behind the opposite ends of the piston stroke.

30 The outlet means may be in communication with the cylinder. The outlet means may be arranged facilitate passage of fluid from each end of the cylinder. Preferably the outlet means is arranged to discharge fluid from each end of the cylinder in front of and behind the opposite ends of the piston stroke.

Preferably the inlet and outlet means are in communication with each of the front chamber and rear chamber.

35 The inlet means may comprise one or more ducts or ports extending from an inlet manifold and communicating with both the front and rear chambers. Similarly, the outlet means may comprise one or more ducts or ports extending from an outlet manifold into communication with both the front and rear chambers.

3.

Fluid supply means may be provided in communication with the inlet means most suitably by way of the inlet manifold.

Preferably the fluid supply means includes pressure means for maintaining fluid supplied to the cylinder under pressure.

5 The pressure means may provide sufficient pressure to move the piston along the full length of the piston stroke when the dispenser is actuated. Preferably, the pressure means will maintain pressure in excess of 50 kpa in the cylinder during the piston stroke. More preferably the pressure means will maintain fluid pressure in the dispenser in the range 100 kpa to 750 kpa most suitably 200 kpa to 500 kpa.

10 The pressure means may be arranged to push fluid from a product supply reservoir into the dispenser. Most suitably, the pressure means may comprise a gas cylinder for providing gas under pressure to the product supply reservoir.

The inlet means suitably includes inlet valves for controlling the supply of fluid to the cylinder to the rear and front of the piston.

15 Preferably the inlet means includes a front inlet valve for controlling supply of fluid under pressure to the front chamber and a rear inlet valve for controlling supply of fluid to the rear chamber.

The outlet means suitably includes outlet valves for controlling the flow of fluid from the cylinder from the rear and front of the piston.

20 Preferably, the outlet means includes a front outlet valve for controlling the discharge of metered fluid from the front chamber and a rear inlet valve for controlling discharge of metered fluid from the rear chamber.

Most suitably, the dispenser includes two inlet and two outlet valves which are preferably solenoid valves.

25 The outlet manifold may be connected to a dispensing outlet for dispensing fluid in metered quantities.

The dispenser may include a dispensing outlet.

30 The dispensing outlet may include a switch for opening the inlet and outlet valves in a sequence which results in a metered amount of fluid being dispensed through the dispensing outlet.

Preferably the piston is provided with one or more o-ring seals most preferably two o-ring seals.

35 Sensing means may be provided to sense the position of the piston in the cylinder. Most preferably the sensing means sense the presence of the piston when it is at either end of its stroke.

Preferably, the sensing means are located externally of the cylinder.

4.

The sensing means may be adapted to initiate closure of the inlet and outlet valves in response to the piston reaching the end of its stroke.

The sensing means may control the valves through a controller. The controller may act immediately or may delay operation of the inlet and outlet valves for a
5 predetermined period after the piston has completed its stroke. Preferably the delay is in excess of 0.1 seconds, more preferably 0.25 seconds.

The sensing means may be in the form of one or more proximity switches. Preferably two such proximity switches are provided in association with the cylinder each proximity switch being located at a position corresponding to the limits of the stroke of
10 the piston. The sensing means may sense the piston position magnetically, photoelectrically, capacitively or electronically.

The proximity switches may be moveably mounted on a support assembly provided on the exterior of the cylinder. Most suitably the support assembly includes one rail more preferably two rails running parallel to the length of the cylinder.

15 The dispenser may include safety cut off means to sense the pressure of fluid in the dispenser, the safety cut off means being operatively connected to shut down the dispenser if the pressure of fluid in the dispenser falls below a predetermined value. Preferably the predetermined value below which the dispenser will shut down is 50 kpa.

20 In a further aspect, the invention provides a dispensing array for dispensing a plurality of fluids which includes a plurality of dispensers as hereinbefore defined.

Operation of each of the dispensers in the dispensing array may most suitably be controlled though a common electronic controller. Preferably the controller includes means to record the amount of fluid dispensed through each dispenser. The controller may also include means to record the number of nips of fluid dispensed from each and/or
25 all of the dispensers.

The controller may be interfaced with electronic cash registers to record the monetary value of fluid dispensed by each dispenser in the dispensing array.

30 The controller may include means to determine the amount of fluid remaining in each fluid reservoir and to initiate a product ordering procedure when the product in a fluid reservoir falls below a predetermined value. The controller may be interfaced with a modem to electronically order replacement product from suppliers as and when necessary.

The controller may include means to predict high volume usage times and to adjust the product threshold at which new product is ordered.

35 The controller may be accessed via a modem from an external source to provide data to authorised users.

The controller may be interfaced with other computer controlled hardware to assist control and data exchange in one or both directions.

5.

The controller may include means to generate a periodic report. The report may include graphs and/or any form of data gathered by the controller.

The dispensing array may have electronic tagging facilities to associate drink orders with separate bar staff.

5 The controller may have a link with other electronic devices such as separate portable small hand held type mini computers. Such electronic devices may be used to record and accept orders for drinks from patrons noting drink(s) type, size, payment method and location (table or poker machine number) and to relay the signal to the bar for a tender to fill appropriate glasses with requested drinks. The same or other floor staff
10 can distribute drinks to patrons. Automated glass dispensing and filling means can be incorporated in the dispensing array responsive to signals from such electronic devices.

The dispensing array may accept new stock details from a bar code format.

BRIEF DESCRIPTION OF THE DRAWINGS

15 The invention will now be described with reference to the accompanying drawings wherein:

Figure 1 shows an elevational view of a dispenser constructed in accordance with the invention;

Figure 2 shows a plan view of the dispenser shown in Figure 1 rotated 180°C; and

20 Figure 3 shows a block diagram of a multiple dispenser array in accordance with the invention.

Referring to Figures 1 and 2 of the accompanying drawings, the dispenser 1 includes a body portion 2. The body portion may be formed of any suitable material such as plastics or non-reactive metal such as stainless steel. However plastics is the most
25 preferred material. Where large numbers of dispensers are required it is anticipated that the various elements of the body will be produced by injection moulding plastics. However, if only small numbers of dispensers are required, the outer housing portions may comprise acrylic blocks whereas the cylinder portions of the dispensers are most suitably formed from an ultra high molecular weight polyethylene material.

30 The dispenser includes a cylinder 3 having a front chamber 4 and a rear 5.

Abutments 6 and 7 are provided in the front and rear of the cylinder to limit the travel of the piston 8 within the cylinder.

An effective sealing effect between the piston and the wall of the cylinder may be achieved by providing the piston with two o-ring seals 9 and 10.

35 The dispenser is provided with an inlet 20 through which fluid may be supplied to the dispenser. The inlet 20 communicates with an inlet manifold which is arranged to supply fluid to the two rear inlet ducts 22 and 23.

6.

A rear inlet valve 24 which will most suitably be an electrically actuated solenoid valve includes a valve chamber 25 through which fluid flows to the rear inlet port 26 when the valve is open.

5 Similarly, front inlet ducts 27 and 28 communicate with the inlet manifold 21 and supply fluid to the front inlet port 29 when the front inlet valve 30 is open. Communication between the front inlet ducts and front inlet port occurs through the valve chamber 40 and is controlled by the front inlet valve 30.

10 The dispenser includes an outlet 41 connected with the outlet manifold 42 which in turn is in communication with the rear outlet duct 43.

The rear outlet duct 43 supplies fluid to the rear outlet ports 44 and 45 control of the flow of fluid between the outlet duct and outlet ports being effected by the rear outlet valve 48 opening and closing communication by way of the valve chamber 49 joining the outlet ports and duct.

15 Similarly a front outlet duct supplies fluid to the front outlet ports 51 and 52 the supply of fluid being controlled by the front outlet valve 53 opening and closing communication between the outlet ports and duct through the valve chamber 54.

Means for sensing the piston at the end of each stroke take the form of rear and front proximity switches 60 and 61 respectively which are mounted on the dispenser with their front faces 62 close to or abutting the outer cylinder wall 63.

20 The mounting of the proximity switches is by way of a mounting assembly in the form of a mounting rail 64 comprising two parallel rails joined by a "C" shaped section to give the overall configuration of a deep "U".

It will be noted that the front and rear proximity switches are located so that they will be immediately above the piston 8 when it reaches either end of its stroke.

25 By varying the position of the Abutments 6 and 7 and the corresponding positions of the front and rear proximidity switches, the length of stroke of the piston can be varied and hence the amount of fluid dispensed by the dispenser in each piston stroke.

Referring to Figure 3 of the drawings, there is shown a dispensing array generally designated 69 which includes a plurality of product reservoirs 70 in the form of
30 sealed cylinders containing different fluid products which can be maintained under pressure.

Means for supplying pressure to the product reservoirs take the form of a gas cylinder 71 for supplying gas under pressure. Whilst the apparatus shows the use of a gas cylinder, it is to be understood that any other appropriate gas generation device such as a
35 pump could also be used.

Gas lines 72 connect the gas cylinder 71 and the product reservoir 70 in order that they may all be maintained at substantially the same pressure.

7.

Fluid product from each of the product reservoirs is delivered to corresponding dispensers 1 by way of a series of supply lines 73.

Discharge lines connect the dispensers to individual dispensing outlets 76 mounted in the rack 75.

5 The rack is constructed in such a way that the dispensing outlets 76 may dispense metered amounts of a chosen fluid into a receptacle 77 as and when required at the activation of a switch associated with the dispensing outlet or the rack.

Control of the operations of the dispensing array is achieved by means of a controller 82 connecting various controllable elements of the dispensing array via the
10 control lines 78 to 81.

Thus, for example, there may be a series of control lines connected to fluid pressure sensing means which may be provided in a range of locations in the dispensing array. For example, pressure sensing means may be provided in the gas cylinder 71, product reservoirs 70, dispensers 1 and any of the supply or discharged lines 73 and 74.

15 Similarly, control lines 79 may be connected to a plurality of switches provided on the rack 75 or in association with the dispensing outlets 76, the switches being arranged to activate a dispensing sequence which results in a metered amount of fluid being dispensed from a chosen dispensing outlet.

20 The control lines 80 are connected to the rear and front proximity switches on the various dispensers. The controller receives signals from the proximity switches indicating that the piston has reached the end of each stroke.

Control lines 81 are associated with each of the dispensers 1 to control operation of the four solenoid valves included in each of the dispensers.

25 In operation, fluid is supplied under pressure from the product reservoirs 70 to each of the dispensers 1 via the supply lines 73. The pressure used is generally expected to fall between 100 and 750 kpa, the most preferred range being 200 to 500 kpa.

30 When an operator activates a switch associated with a particular dispensing outlet 76, the controller 82, via the control lines 81 opens appropriate inlet and outlet valves in the respective dispenser 1, the valves concerned being dependent on the position of the piston 8 at the commencement of the cycle.

For example, at the commencement of the cycle, all inlet and outlet valves will be closed and the piston will be at the front most or rear most portion of its stroke awaiting activation. For the purposes of this description we will assume the piston is in the rear portion of its stroke adjacent abutment 7.

35 Thus, when the cycle is initiated, the rear inlet valve 24 and the front outlet valve 53 are opened by the controller.

8.

Fluid under pressure passes from a product reservoir through the inlet 20 into the inlet manifold 21 and continues on through the rear inlet ducts 22 and 23 via the valve chamber 25 and rear inlet port into the rear chamber 5.

Thus, the fluid under pressure in rear chamber 5 pushes against the rear face of the piston 8 pushing the piston forward in the direction of the arrow until the piston completes one stroke when it pushes up against the abutment 6.

During the stroke a metered amount of fluid exits through the front outlet ports 51 and 52 via the valve chamber 54 and the front outlet duct 50 into the outlet manifold 42 and the outlet 41 to be supplied via the feedline 74 to the appropriate dispensing outlet 76.

Upon reaching the abutment 6, the front proximity switch 61 senses the presence of the piston and sends a signal to the controller 72 which after a delay of about $\frac{1}{4}$ of a second closes the rear inlet valve 24 and front outlet valve 53 through the control lines 81 to complete the dispensing cycle.

Should the pressure in the dispensing array ever go below a predetermined minimum, pressure sensors connected to the control lines 78 signal the dropping pressure to the controller 82 which then closes down the dispenser array by closing all the inlet and outlet valves.

It should be noted that the cylinder remains filled with fluid during the entire cycle as fluid enters the cylinder to push the piston forward at the same rate as it exits the cylinder to be dispensed. Thus at the end of the cycle the dispenser is ready to go into the next cycle without the need to refill the dispenser as refilling has occurred during dispensing in the previous cycle.

While it has been convenient to describe the invention herein in relation to particular preferred embodiments, it is to be appreciated that other constructions and arrangements are also considered as falling within the scope of the invention. Various modifications, alterations, variations and/or additions to the constructions and arrangements described herein are also considered as falling within the ambit and scope of the present invention.

9.

The claims defining the invention are as follows:

1. A dispenser including:-
 - (i) a cylinder;
 - (ii) a piston reciprocable within the cylinder;
 - 5 (iii) inlet means to the cylinder; and
 - (iv) outlet means from the cylinder;

the arrangement being such that the piston in its reciprocable movement within the cylinder pushes metered amounts of liquid from the cylinder through the outlet means on each stroke of the piston.
- 10 2. A dispenser according to Claim 1 wherein the cylinder includes a stroke section defined by the stroke of the reciprocating piston, a front chamber located beyond the most forward reach of the stroke of the piston and a rear chamber located beyond the most rearward reach of the stroke of the piston.
3. A dispenser according to Claim 2 wherein the inlet means includes a front inlet
15 valve for controlling supply of fluid to the front chamber and a rear inlet valve for controlling supply of fluid to the rear chamber.
4. A dispenser according to Claim 2 wherein the outlet means includes a front outlet valve for controlling the discharge of metered fluid from the front chamber and a rear outlet valve for controlling discharge of metered fluid from the rear chamber.
- 20 5. A dispenser according to any one of claims 2 to 4 including stop means, the stop means including front and rear abutments provided in the cylinder at opposite ends of the stroke section.
6. A dispenser according to any one of the preceding claims including fluid supply means provided in communication with the inlet means, the fluid supply means including
25 pressure means for maintaining fluid in the fluid supply means under pressure in excess of 50kpa.
7. A dispenser according to Claim 6 wherein the pressure means maintain fluid pressure in the fluid supply means in the range 100kpa to 750 kpa, the pressure means including a gas cylinder arranged to provide gas under pressure to the fluid supply means.
- 30 8. A dispenser according to claim 5 or 6 as appended to claims 3 and 4 including a dispensing outlet in communication with the outlet means, the dispensing outlet including a switch for opening the inlet and outlet valves in a sequence to dispense a metered amount of fluid through the dispensing outlet.
9. A dispenser according to any one of the preceding claims including sensing
35 means adapted to sense the position of the piston in the cylinder when it is at either end of its stroke, the sensing means being arranged to initiate closure of the inlet and outlet valves in response to the piston reaching either end of its stroke.

10.

10. A dispenser according to Claim 9 wherein the sensing means include a controller which delays operation of the inlet and outlet valves for a predetermined period after the piston has completed a stroke.

5 11. A dispenser according to any one of the preceding claims including safety cutoff means, arranged to sense the pressure of fluid in the dispenser, the safety cutoff means being operatively connected to shut down the dispenser if the pressure of fluid in the dispenser falls below a predetermined value.

10 12. A dispenser according to Claim 9 or 10 wherein the sensing means include proximity switches mounted externally of the cylinder, the proximity switches being located at each end of the piston stroke.

13. A dispenser according to Claim 11 wherein the proximity switches sense the piston position magnetically, photoelectrically, capacitively or electronically.

15 14. A dispenser according to anyone of claims 3 to 12 as appended to Claim 2 wherein inlet means and outlet means each comprise one or more ducts or ports respectively extending from inlet and outlet manifolds into communication with the front and rear chambers.

15. A dispensing array for dispensing a plurality of fluids, the dispensing array including a plurality of dispensers as defined in any one of claims 1 to 14.

20 16. A dispensing array according to Claim 17 wherein the dispensing array includes means to record the amount of fluid dispensed through each dispenser in the array.

17. A method of metering fluid from a source including the steps of:-

- (i) supplying fluid from the source to a cylinder having a reciprocating piston;
- (ii) moving the piston a predetermined distance in the cylinder; and
- 25 (iii) dispensing metered amounts of fluid from the cylinder in response to each stroke of the

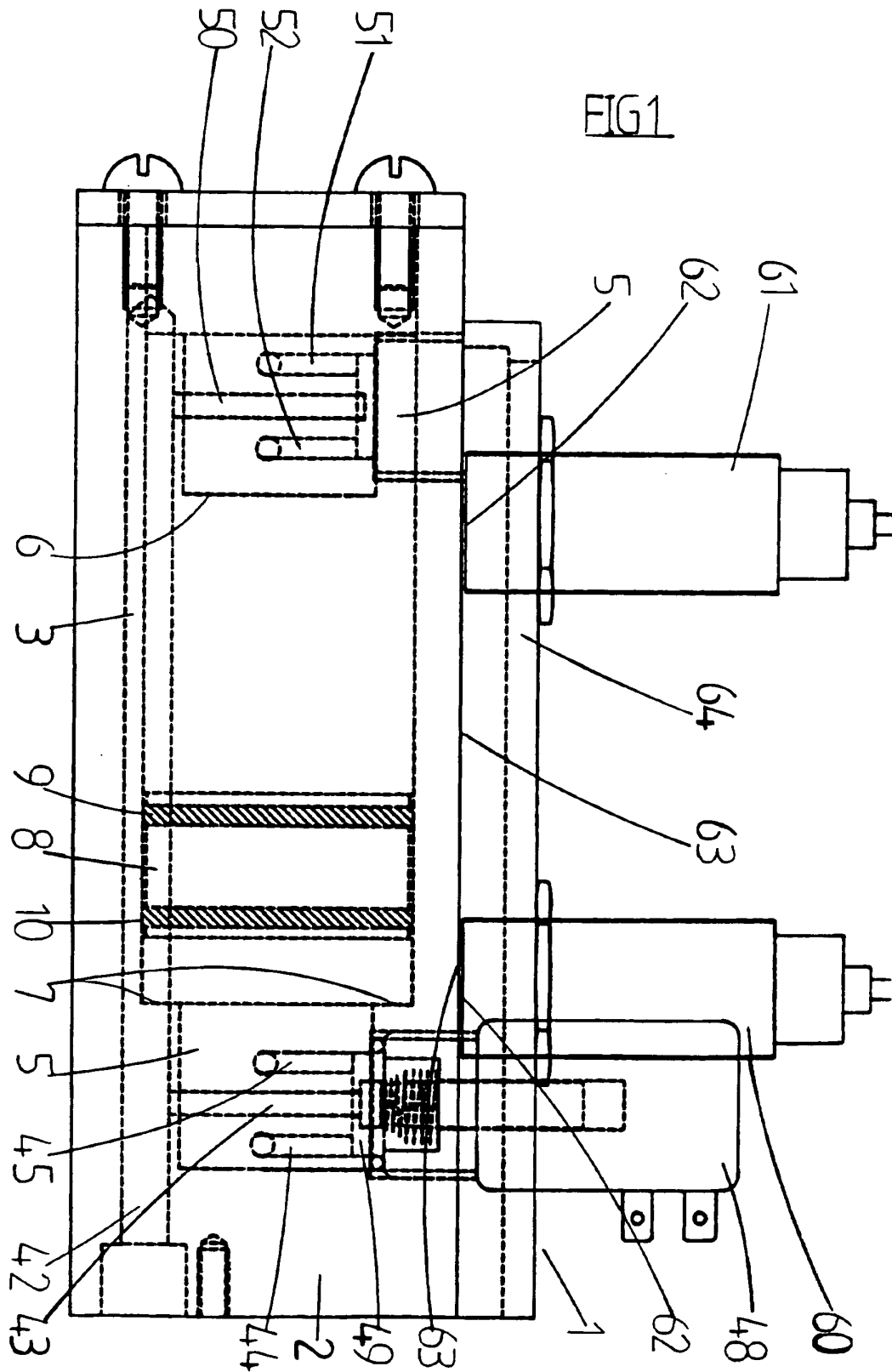
reciprocating piston

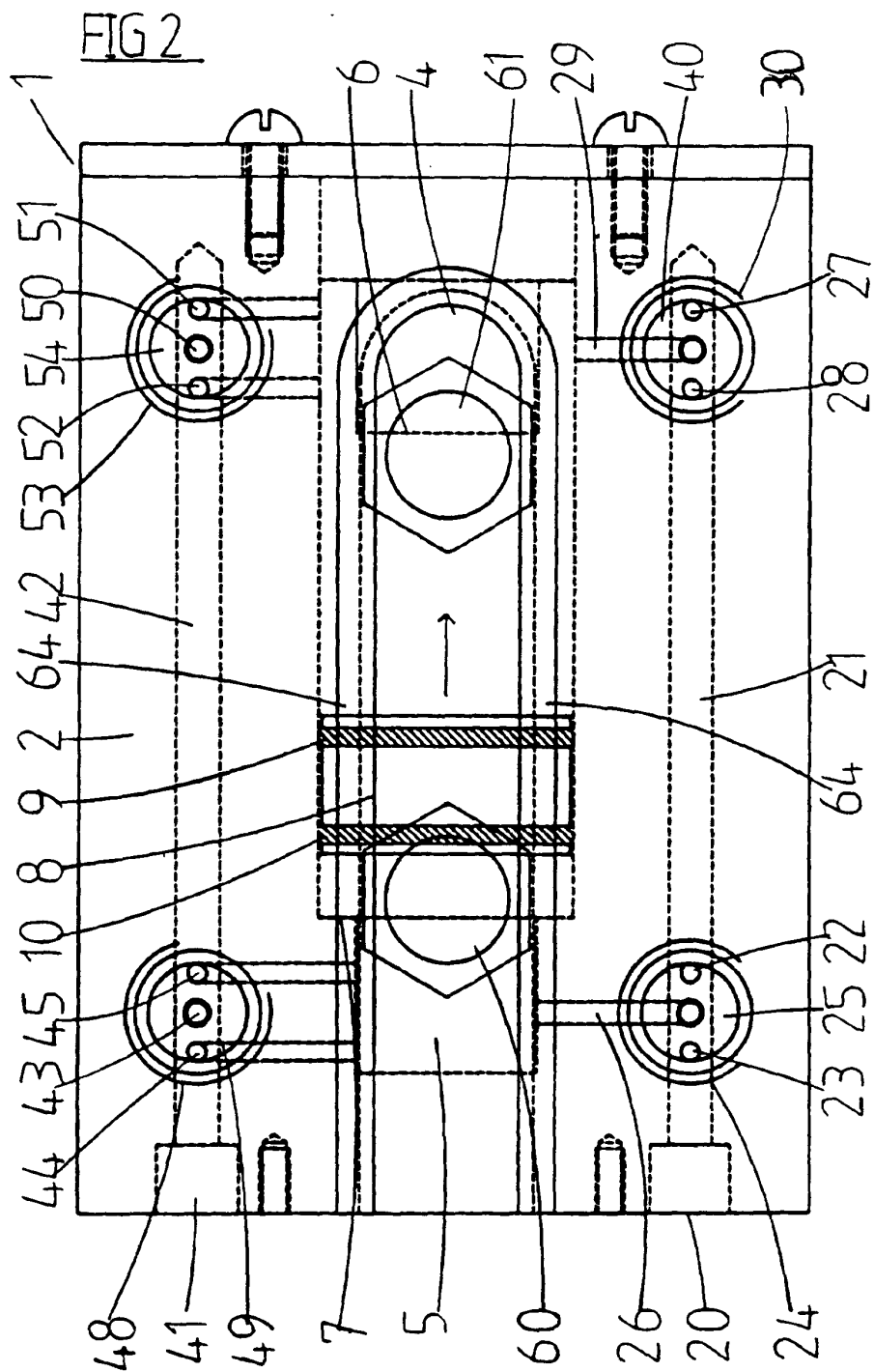
18. A method according to Claim 17 wherein the fluid is supplied under pressure to the cylinder and the piston moves in response to pressure from the fluid.

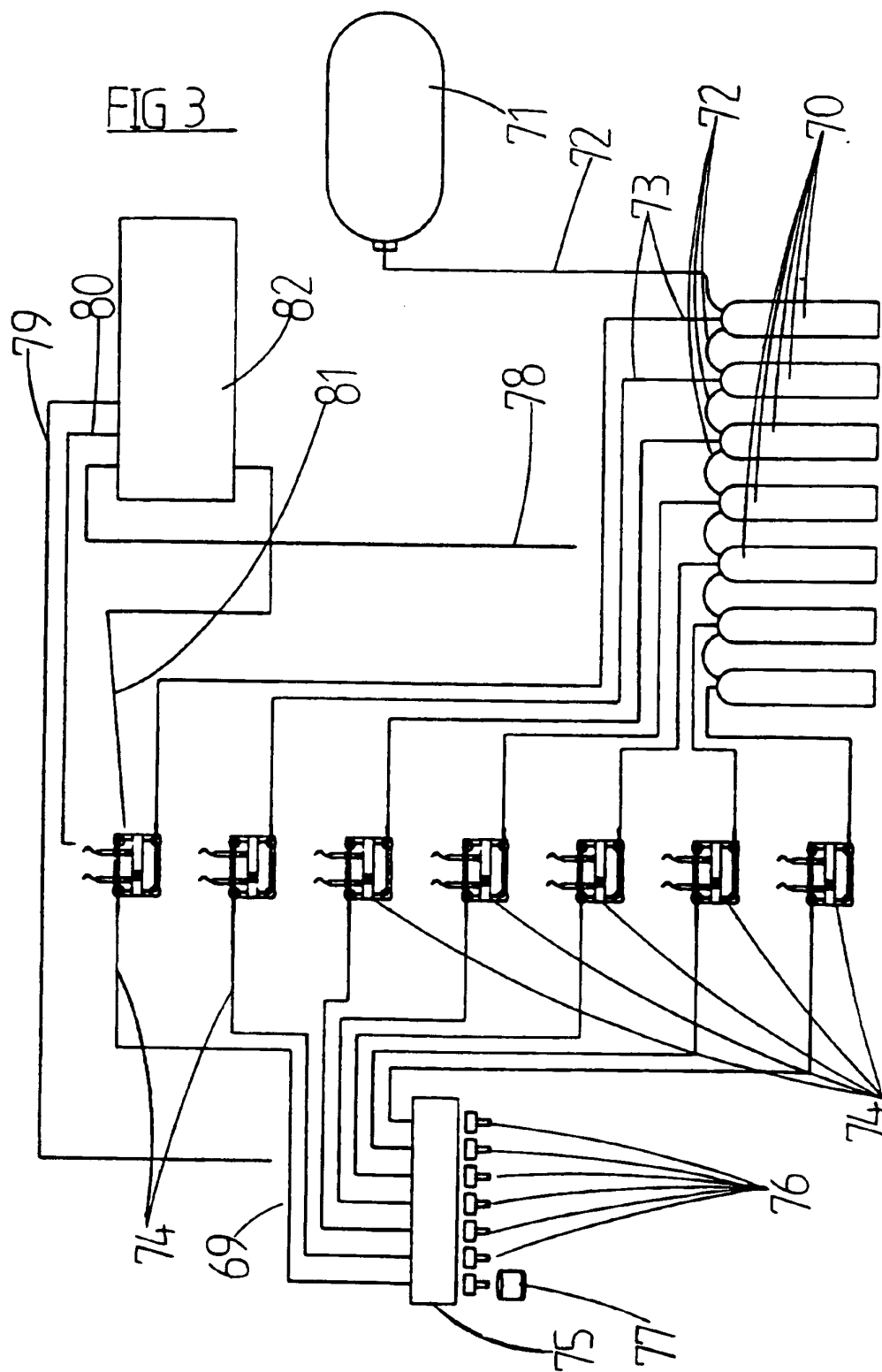
30 19. A dispenser according to Claim 1 substantially as herein before described with reference to any one of the accompanying drawings.

20. A method of metering fluid from a source according to Claim 17 substantially as hereinbefore described.

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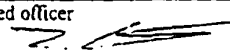






INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 96/00154

A. CLASSIFICATION OF SUBJECT MATTER		
Int Cl ⁶ : G01F 11/04 3/16 3/18		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) IPC G01F 11/04 3/16 3/18		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU: IPC as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	GB 1432741 A (ALFA LAVAL AKTIEBOLAGET) 22 April 1976 Fig. 1, page 2 lines 35-107 Fig. 1, page 2 lines 35-107	1-4,9,10,12-14,17 15
X Y	GB 901850 A (GASKELL AND CHAMBERS LIMITED) 25 July 1962 Fig. 1, page 1 line 18 - page 3 line 6 Fig. 1, page 1 line 18 - page 3 line 6	1-4,14,17,18 15
X Y	US 3292824 A (ARP et al.) 20 December 1966 the whole document the whole document	1-4,14,17,18 15
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 22 May 1996		Date of mailing of the international search report 30TH MAY 1996.
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (06) 285 3929		Authorized officer  Z. STANOJEVIC Telephone No.: (06) 283 2168

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/AU 96/00154

C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 2722441 A (K. KERNFORSCHUNGS) 30 November 1978	
Y	Fig. 1, page 6 lines 14-30	1-4,14,17,18
		15
X	GB 1307521 A (T. P. PRIESTLEY) 21 February 1973	
Y	the whole document	1-4,14,17,18
		15
X	GB 1350345 A (DART INDUSTRIES INC.) 18 April 1974	
Y	Fig. 1, page 1 line 34 - page 2 line 48	1-4,14,17,18
		15
X	EP 443276 A (NORDSON CORP) 28 August 1991	
Y	Fig. 1, abstract	1-5,14,17
		15
X	US 3344667 A (MALTBY) 3 October 1967	
Y	Fig. 1, column 1 line 64 - column 4 line 54	1-4,14,17
		15

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/AU 96/00154

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
GB	1432741	DE	2402213	FR	2218555	JP	50025262
		NL	7400973	SE	380347		
DE	2722441						
GB	1307521						
EP	443276						
							END OF ANNEX